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EXAMINER

HOLLWEG, THOMAS A

ART UNIT	PAPER NUMBER
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2879

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/539,328

Applicant(s)

VAN DER POEL ET AL.

Examiner

Thomas A. Hollweg

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/15/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on June 15, 2005, is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4, 10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al., U.S. Patent No. 6,420,726 B2, in view of Lockwood, U.S. Patent No. 5,729,244.

4. With regard to claim 1, in figure 2, Choi discloses a display device comprising a field emission structure having first (20) and second (11) planar, parallel substrates which are spaced apart so as to form a gap therebetween, an anode (14), which is arranged at the first substrate (20), a number of cathodes (12), which are disposed in a plane on the second substrate (11), on the side facing the first substrate (20), a number of gate electrodes (13) for controlling electron emission from the cathodes (12), which gate electrodes (13) are disposed in a plane on the second substrate (11), under the cathodes (12), and are separated from the cathodes (12) by an electrically insulating

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layer (17). Choi does not expressly disclose an electron beam guidance element being provided in the gap between the first and second substrates.

5. Lockwood, in figure 2, teaches a field emission display device having an electron beam guidance element (50) being provided in the gap between the first and second substrates. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct Choi field emission display device including an electron beam guidance element being provided in the gap between the first and second substrates, as taught by Lockwood. Including the electron beam guidance element increases resolution of the display by suppressing electron beam spread. Choi and Lockwood are analogous because they are from the same field of endeavor of field emission displays.

6. With regard to claim 2, in figure 2, Choi discloses that the cathodes (12) are parallel cathode strips and the gate electrodes (13) are parallel gate strips, which extend in a direction perpendicular to the cathode strips (col. 4, lines 14-17), such that emitter elements (15) are formed at intersections between cathode strips (12) and gate strips (13), which emitter elements (15) are addressable by activating the corresponding cathode (12) and gate strips (13) (col. 5, lines 1-7).

7. With regard to claim 3, all of the limitations are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 2, however, the modified device discussed in the rejection of claim 2 does not expressly disclose that each such emitter element has a corresponding picture element in a display screen, which is

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associated with the anode, and a corresponding electron guiding funnel in the electron beam guidance element.

8. Lockwood, in figures 7 and 8, teaches a field emission display device wherein each such emitter element (102) has a corresponding picture element (140, 142, 144) in a display screen (130), which is associated with the anode (132), and a corresponding electron guiding funnel (118) in the electron beam guidance element (114) (col. 9, lines 32-48).

9. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, as discussed in the rejection of claim 2, so that each such emitter element has a corresponding picture element in a display screen, which is associated with the anode, and a corresponding electron guiding funnel in the electron beam guidance element, as taught by Lockwood. Associating a picture element to each cathode and guidance element will allow for precise activation of each picture element, resulting in a higher resolution display.

10. With regard to claim 4, in the modified device, disclosed by Choi and Lockwood, discussed in the rejection of claim 1, includes the electron beam guidance element (50) is a plate (54) extending in a plane which is parallel to the first planar substrate (col. 4, lines 44-46).

11. With regard to claim 10, in figure 2, Choi discloses that the cathodes (15) comprise carbon nanotubes (15) (col. 4, lines 21-24).

12. With regard to claim 13, in figure 2, Choi discloses that the insulating layer (17) is a solid layer (col. 4, lines 61-62).

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13. Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Lockwood, as applied to claims 1 and 2, and in further view of Chien, U.S. Patent No. 5,729,087.

14. With regard to claim 5, all of the limitations are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 2, however, the modified device discussed in the rejection of claim 2 does not expressly disclose that a cathode strip comprises a surface broadening in the area of an emitter element.

15. Chien, in figure 4A, teaches an field emission display device where the cathode electrodes (52) are parallel strips and the gate electrodes (54) are parallel strips and the cathode strips (52) are arranged in a direction perpendicular to the direction of the gate strips (54), and a cathode strip (52) comprises a surface broadening in the area of an emitter element (17).

16. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, as discussed in the rejection of claim 2, wherein a cathode strip comprises a surface broadening in the area of an emitter element, as taught by Chien. When the cathode is broader in the area of the emitter, the field generated can be stronger and electron emission can be increased. Choi, Lockwood and Chien are analogous because they are from the same field of endeavor of field emission display devices.

17. With regard to claim 6, all of the limitations are disclosed by Choi, Lockwood and Chien, by the modified device discussed in the rejection of claim 5, however, the

modified device discussed in the rejection of claim 5 does not expressly disclose that the cathode strip comprises cut-outs in the surface broadening.

18. Chien, in figure 4A, teaches a field emission display device where the cathode strip (52) comprises cut-outs (17) in the surface broadening. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, as discussed in the rejection of claim 5, wherein the cathode strip comprises cut-outs in the surface broadening, as taught by Chien. Cut-outs in the surface broadening of the cathode strip an arrangement of the emission elements relative to the cut-outs improve the uniformity of the emission within each pixel, as taught by Choi (col. 4, lines 42-60).

19. With regard to claim 7, all of the limitations are disclosed by Choi, Lockwood and Chien, by the modified device discussed in the rejection of claim 5, including, as disclosed in Choi, figure 4A, that the cathode strip (12) in the area of the emitter element (15) has the shape of a ring.

20. With regard to claims 8 and 9, all of the limitations are disclosed by Choi, Lockwood and Chien, by the modified device discussed in the rejection of claims 5 and 7, however, the modified devices discussed in the rejection of claims 5 and 7 do not expressly disclose that the cathode strip in the area of the emitter element has the shape of at least two concentric rings, or is meander-shaped.

21. Choi teaches that experimentation has revealed that the strongest field exists at the edges of the cathode, and therefore the edges are the best area to form the emitter elements. For this reason Choi discloses several embodiments, shown in figures 4A-4D,

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where the cathode strip is formed with cut-out holes, so as to create more edges on the cathode strip, around which emitter elements are positioned (col. 4, lines 25-39). One having ordinary skill in the art would understand that the design of the cut-outs on the cathode strip are a matter of design choice, so long as they create more edge areas on which to form emitter elements.

22. Therefore, at the time of invention, it would have been an obvious design choice for a person having ordinary skill in the art to construct the modified devices discussed in the rejections of claims 5 and 7 where the cathode strip in the area of the emitter element has the shape of at least two concentric rings, or is meander-shaped. Either of these design choices would effectively increase the edge areas on the cathode strip and therefore would provide increased areas for the emitter elements to be positioned, increasing the electron emission and, consequently the brightness of the display device.

23. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Lockwood, as applied to claims 1 and 2, and in further view of Derraa, U.S. Patent No. 6,417,627.

24. With regard to claim 11, all of the limitations are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 2, however, the modified device discussed in the rejection of claim 2 does not expressly disclose that a gate strip comprises a cut-out in the area of an emitter element.

25. Derraa, in figures 2-4, teaches a field emission display (10) where the cathode electrodes (24) are parallel strips and the gate electrodes (26) are parallel strips and the cathode strips (24) are arranged in a direction perpendicular to the direction of the gate

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strips (26), and a gate strip (26) comprises a cut-out (36) in the area of an emitter element (30).

26. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, discussed in the rejection of claim 2, where a gate strip comprises a cut-out in the area of an emitter element. This would reduce the area of the overlap of the metal portions of the electrode strips, effectively reducing the RC time constant for the display device, as taught by Derraa (col. 2, line 46-52). Choi, Lockwood and Derraa are analogous because they are from the same field of endeavor of filed emission display devices.

27. With regard to claim 12, all of the limitations are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 11, however, the modified device discussed in the rejection of claim 11 does not expressly disclose that the cut-out of the gate electrode substantially corresponds to the extension of a corresponding cathode surface in the area of the emitter element, so as to obtain minimal overlap therebetween.

28. Derraa, in figures 2-4, teaches a field emission display (10) where the cathode electrodes (24) are parallel strips and the gate electrodes (26) are parallel strips and the cathode strips (24) are arranged in a direction perpendicular to the direction of the gate strips (26), a gate strip (26) comprises a cut-out (36) in the area of an emitter element (30), and where the cut-out (36) of the gate electrode (26) substantially corresponds to the extension of a corresponding cathode (24) surface in the area of the emitter element (30), so as to obtain minimal overlap therebetween (col. 2, lines 7-25).

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29. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, discussed in the rejection of claim 2, where the cut-out of the gate electrode substantially corresponds to the extension of a corresponding cathode surface in the area of the emitter element, so as to obtain minimal overlap therebetween, for the same reasons discussed in the rejection of claim 11.

30. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Lockwood, as applied to claims 1 and 2, and in further view of Imura, U.S. Patent No. 5,651,898.

31. All of the limitations of claim 14 are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 1, however, the modified device discussed in the rejection of claim 1 does not expressly disclose that the insulating layer has two sub-layers with different permittivities (ϵ_r), the sub-layer with the highest permittivity being closest to the gate electrodes.

32. Imura, in figures 2 and 3, teaches a field emission display device with an insulating layer (2, 6) between the gate electrodes (3) and the cathode (1), where the insulating layer has two sub-layers (2, 6) with different permittivities (ϵ_r), the sub-layer with the highest permittivity (6) being closest to the gate electrodes (3).

33. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, as discussed in the rejection of claim 1, where insulating layer has two sub-layers with different permittivities (ϵ_r), the sub-layer with the highest permittivity being closest to the gate electrodes, as taught in Imura.

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Forming the insulating sub-layer with the highest permittivity closest to the gate electrodes would create higher field strength around the emitting elements, creating greater emission and a brighter display. Choi, Lockwood and Imura are analogous because they are from the same field of endeavor of field emission display devices.

34. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Lockwood, as applied to claims 1 and 2, and in further view of Kitamura et al., U.S. Patent No. 6,848,962 B2.

35. All of the limitations of claim 15 are disclosed by Choi and Lockwood by the modified device discussed in the rejection of claim 1, however, the modified device discussed in the rejection of claim 1 does not expressly disclose auxiliary gate electrodes, disposed substantially in the same plane as the cathodes.

36. Kitamura, in figures 2A and 2B, teaches a field emission display device having gate electrodes (2), disposed substantially in the same plane as the cathodes (3). Kitamura further teaches that electron emission can be achieved laterally in a low electric field, and adding a coplanar gate electrode on the same layer as the cathode is simple to produce (col. 5, lines 37-59).

37. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the modified device, as discussed in the rejection of claim 1, further comprising auxiliary gate electrodes, disposed substantially in the same plane as the cathodes, as taught by Kitamura. Including additional gate electrodes on the same plane as the cathodes would allow the electron emission to be controlled more precisely, allowing for a higher quality image from the display device.

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Choi, Lockwood and Kitamura are analogous because they are from the same field of endeavor of field emission display devices.

Conclusion

38. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas A. Hollweg whose telephone number is (571) 270-1739. The examiner can normally be reached on Monday through Friday 7:30am-5:00pm E.S.T..

39. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

40. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TH



Nimesh Patel